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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/672,644	09/28/2000	Tetsu Koyama	M-9579 US	7976

33031 7590 06/09/2004

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EXAMINER

VARTANIAN, HARRY

ART UNIT	PAPER NUMBER
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2634

DATE MAILED: 06/09/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/672,644

Applicant(s)

KOYAMA ET AL.

Examiner

Harry Vartanian

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 12-24 and 26-39 is/are rejected.
- 7) ☒ Claim(s) 7-11 and 25 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Detailed Action

Claim Objections

1. Claim 12 is objected to because of the following informalities: the word method needs to be undeleted in the preamble and the punctuation mark after "**comprises**" in the body should be ":" not ";". Appropriate correction is required.
2. Claim 19 is objected to because of the following informalities: The preamble reads "An apparatus for for use". Appropriate correction is required.
3. Claim 33 is objected to because of the following informalities: the punctuation mark after "**comprises**" in the body should be ":" not ";". Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. Claims 26-32 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The variables used in the equations are critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). The applicant does not state the meaning of variable $Q_k^{i,j}$. The sentence in the amendment is incomplete.

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Response to Arguments

2. Applicant's arguments with respect to Claim 1-39 have been considered but are moot in view of the new ground(s) of rejection. Since the independent Claims 1, 13, 19, 26, and 33 were amended, a new search was necessitated.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 12-13, 19-24, and 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nobakht(United States of America Patent #6,009,120) in view of Agazzi et al(United States of America Patent #6477200). Regarding Claim 1, Nobakht meets the following limitations of the Claim:

an input node configured to receive an input signal vector; and **fig 3**

a multi-dimensional equalizer(**abstract**) coupled to the input node, wherein the multidimensional equalizer is configured to cancel [far end cross talk and] intersymbol interference, (**column 8, lines 44-67**)

wherein the multi -dimensional equalizer is configured to process the input signal vector to provide an output signal vector. **fig 3**

Nobakht fails to teach that his multi-dimensional equalizer cancels cross-talk. However, agazzi et al discloses a gigabit Ethernet transceiver with a multiple DFE equalizer and that his demodulation method can cancel both FEXT. More specifically he states:

The gigabit transceiver 200 can optionally include a filter to cancel far-end crosstalk noise (FEXT canceler). (**Column 12, lines 47-64**)

Therefor it would have been prima facie obvious for Nobakhts multidimensional equalizer to have the ability to cancel FEXT crosstalk. A motivation to combine is that cross talk can cause bit errors and therefor reduce system performance.

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Regarding Claim 12, the rejection of Claim 1 above meets the first limitation. Agazzi meets the following limitation:

compensating an output signal vector based on a plurality of tap matrices and an error vector signal, wherein the error vector signal is based on the difference between an input signal vector and the compensated output signal vector. **(Column 12, Lines 24-38)**

Regarding Claims 19, 21 and 33 the rejection for Claim 12 above meets the limitations for the Claim.

Regarding Claims 22, Agazzi et al meets the following limitations of the Claim:

a first matrix multiplication operator coupled to generate the product of the delayed input signal vector and the error vector. **(Column 40, lines 36-54); (column 63, lines 22-44); also see fig 21; use of a matrix is inherent, since it is a multi-dimensional system**

Regarding Claims 23, Agazzi et al meets the following limitations of the Claim:

a matrix summation operator coupled to receive the product from the first matrix multiplication operator, wherein the matrix summation operator is operable to add the product from the first matrix multiplication operator to output from a matrix tap unit delay operator. **(Column 40, lines 36-54); (column 63, lines 22-44); also see fig 21; use of a matrix is inherent, since it is a multi-dimensional system**

Regarding Claims 24, Agazzi et al meets the following limitations of the Claim:

a plurality of delayed tap matrices based on input from the matrix summation operator. **(Column 40, lines 36-54); (column 63, lines 22-44); also see fig 21; use of a matrix is inherent, since it is a multi-dimensional system**

Regarding Claims 13, 20, and 34 Agazzi et al meets the following limitations of the Claim:

wherein compensating the output signal vector includes applying a delay to the input signal vector **(Column 40, lines 36-54)**

4. Claims 2-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nobakht in view Agazzi et al(US Patent #6477200) further in view of Choi(US Patent #5,675,394). Nobakht and Agazzi et al met all the limitations of Claims 2, 3, and 6 please see above paragraphs, for a multi-dimensional equalizer where "coefficients...are adjusted on the basis

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of an error signal e_1 determined by comparing the output and input of the preliminary decision device 150." (Column 6, Lines 60-67 to Column 7, Line 1) **NOBAKHT**

What Nobakht fails to disclose is the use of the steepest decent gradient operator.

However, Choi discloses the use of "...minimization of the cost function $D_{sup}(2)$ with respect to the equalizer coefficients can be performed recursively according to a known steepest decent method." (Column 4, Lines 46-54) Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made that Nobakht's multi-dimensional equalizer in combination with Agazzi et al use the steepest decent method as disclosed by Choi. The motivation to use steepest decent method is that it is one of the fastest ways to compute error in a multi-dimensional(variable) space, as is the case in a Gigabit Ethernet system, as stated by Choi.

Regarding Claim 4 and 5, Agazzi et al discloses the use of a echo and Next canceller in the abstract.

8. Claims 14-16, 22, and 35-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nobakht in view of Agazzi et al further in view of Loginov et al (ESS, Paris 9/96 SPRA321). Nobakht and Agazzi meet all the limitations of Claims 14, 22, and 35 (See above Paragraphs) expect the multiplication of the error vector by a delayed input signal vector.

However, Loginov discloses a multi-dimensional Equalizer with decision feedback that takes delayed input versions of input (a) and combines it with an error vector(e) (Fig 3). He also discloses the method of calculating the "correcting matrix" (Pg. 16) by multiplying the error vector by delayed versions of the input (Fig 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made that

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Nobakht's and Agazzi's multi-dimensional equalizer be combined with Loginovs method of calculating an adjusted output vector. The motivation to do so is that the result of error times input signal could be used to adjust the equalizers tap values in order to reduce error, as stated by Loginov.

Regarding Claim 15, Agazzi et al meets the following limitations of the Claim:

wherein compensating the output signal vector includes generating the plurality of tap matrices based on a plurality of delayed tap matrices and the product of the error vector signal and the delayed input signal vector. **(Column 62, lines 3-28) (Column 40, lines 36-54); (column 63, lines 22-44); also see fig 21**

Regarding Claim 16, Agazzi et al meets the following limitations of the Claim:

wherein compensating the output signal vector includes generating the output signal vector based on the product of the delayed tap matrices and the delayed input signal. **(Column 62, lines 3-28) (Column 40, lines 36-54); (column 63, lines 22-44) see fig 21**

Regarding Claim 36, Agazzi et al meets the following limitations of the Claim:

wherein the means for compensating the output signal vector includes means for generating the plurality of tap matrices based on a plurality of delayed tap matrices and the product of the error vector signal and the delayed input signal vector. **(Column 40, lines 36-54); (column 63, lines 22-44); also see fig 21; use of a matrix is inherent, since it is a multi-dimensional system**

Regarding Claim 37, Agazzi et al meets the following limitations of the Claim:

wherein the means for compensating the output signal vector includes means for generating the output signal vector based on the product of the delayed tap matrices and the delayed input signal. **(Column 40, lines 36-54); (column 63, lines 22-44); also see fig 21; use of a matrix is inherent, since it is a multi-dimensional system**

9. Claims 17-18 and 38-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nobakht in view of Agazzi et al further in view of Lechleider(US Patent #5,181,198). Nobakht meet all the limitations of Claims 17-18 and 38-39(See above paragraphs), except the use of an echo and NEXT canceller.

However, Lechleider discloses "the receiver incorporates a two-dimensional generalization to a conventional decision feedback equalizer, namely, an implementation to

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cancel both pre-cursor and post-cursor intersymbol interference as well as far-end crosstalk.”(Abstract) In addition, Lechleider discloses the use of an echo canceller in his receiver(Fig 4). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made that Nobakht’s and Agazzi’s multi-dimensional equalizer be combined with Lechleider’s equalizer. The motivation to combine is that echo and FEXT cancellers are typical components used in digital receivers to combat miss matches in impedances on the transmission line and cross talk, respectively.

Allowable Subject Matter

5. Claim 25, 7-11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry Vartanian whose telephone number is 703.305.8698. The examiner can normally be reached on 9-5:30 Mondays to Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 703.305.4714. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Harry Vartanian
Examiner
Art Unit 2634

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